

## FOREST PRODUCTS

**FOREST PRODUCTS** have provided people with food, shelter, clothing, and fuel since the beginning of civilization. Prehistoric people ate berries and nuts that grew in forests. They built shelters from the branches of trees and wore clothing made of plant materials. By about 500,000 B.C., they used wood as a fuel to make fire.

Today, people throughout the world use more wood for fuel than for any other purpose. In the developing nations, about 90 per cent of the people rely on firewood for cooking and heating. In the United States and other industrialized countries, wood is used chiefly as a building material and as a source of pulp for making paper. The construction of a typical American house requires about 18,000 *board feet* of wood. A board foot is 1 foot (30 centimeters) long, 1 foot wide, and 1 inch (2.5 centimeters) thick. The amount of paper and paperboard used annually in the United States averages 575 pounds (261 kilograms) per person.

There are thousands of forest products, but most can be classified into one of two main groups, *wood products* or *chemical products*. Wood products are made directly from wood. They include lumber, plywood, and other construction materials. Chemical products are manufactured by breaking down wood cells through chemical processes. Such products may be entirely different from wood. For example, cellophane, lacquer, paper, and

rayon do not look or feel like wood—but all are made from it. Other forest products come from the bark, fruit, gum, leaves, and sap of trees. Each person in the United States uses enough forest products yearly to make up a tree 100 feet (30 meters) tall and 16 inches (41 centimeters) in diameter.

### Wood Products

Wood has many characteristics that make it an important construction material. It can be easily shaped with tools and fastened with nails, screws, staples, and adhesives. It is light but strong. Wood provides insulation against electricity, heat, cold, and sound. It can hold paint and other finishes, and it does not rust. Unlike metal construction materials, wood is a *renewable resource*—that is, a new supply grows after the timber has been harvested. Some of the chief wood structural materials are *round timbers*, *lumber*, *plywood* and *veneers*, and *composition board*.

**Round Timbers** include *pilings*, *poles*, and *posts*. Pilings are driven into the ground as foundations for buildings, wharves, and other heavy structures. Poles link overhead telephone wires and power lines. Posts are used chiefly to build fences and corrals.

Round timbers are simply trees that have been stripped of their branches and bark, and cut into logs of a desired length. The logs are dried and treated with various chemical preservatives, such as creosote and pentachlorophenol. The chemicals help the wood resist decay for about 40 years.

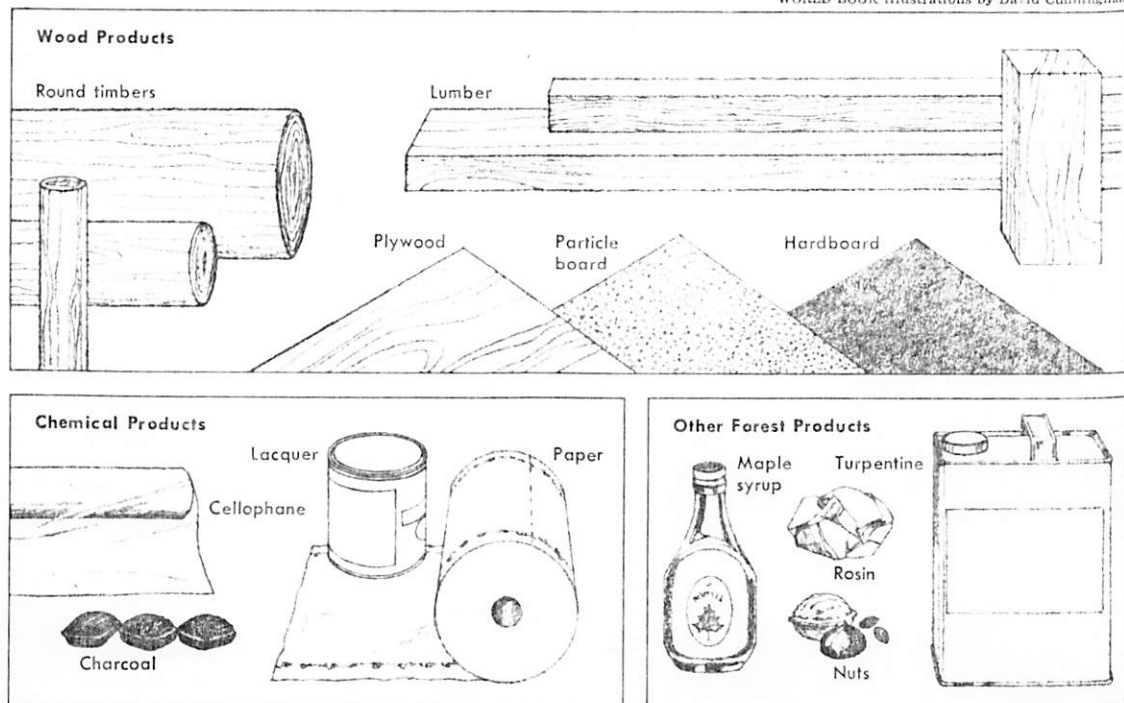
**Lumber** includes boards and larger pieces of wood that have been sawed from logs. The construction in-

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### Some Kinds of Forest Products

Trees from forests provide thousands of wood, chemical, and other products that people use every day. Wood products include lumber and plywood. Chemical products, such as charcoal and paper, are made from wood by various chemical processes. Other forest products include nuts and turpentine.

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dustry uses about 75 per cent of the lumber manufactured in the United States. The rest goes to factories that make baseball bats, crates, furniture, railroad ties, shingles, toys, and thousands of other products.

Wood scientists classify lumber as *softwood* or *hardwood*, depending on the kind of tree. Softwood trees stay green the year around, and hardwood trees lose their leaves every autumn. However, this classification system does not indicate the hardness of lumber because various softwoods are harder than some hardwoods. Most softwoods can be easily sawed, planed, chiseled, or bored, and so they are used chiefly for structural work. Such woods include cedar, Douglas fir, hemlock, and pine. Hardwoods have beautiful grain patterns and are widely used for floors, furniture, and paneling. Popular hardwoods include birch, maple, oak, sweet gum, walnut, and mahogany.

**Plywood and Veneers.** Plywood consists of an odd number of thin layers of wood glued together. The layers, called *veneers*, are arranged so that the grain pattern of each layer is at a right angle to the grain of the next layer. This arrangement gives plywood several advantages over lumber. Plywood shrinks, swells, and warps less than lumber, and it can be easily nailed near the edges without splitting. In addition, less expensive woods can be used for the inside layers of plywood than for the outer surfaces. Thus, plywood can look like expensive wood but cost less. Manufacturers may also glue hardwood veneers to softwood lumber, combining the advantages of each type of wood. Plywood and veneers are widely used in the construction and furniture industries.

**Composition Board** includes *particle board*, *insulation board*, and *hardboard*. These materials are made from small pieces of wood left over in sawmills and paper mills. Particle board consists of flakes of wood that have been mixed with an adhesive and pressed into a board. Much particle board is covered with veneers and used in making cabinets, doors, and furniture. Insulation board is made by exploding chips of wood into fibers by means of high-pressure steam. The wet fibers are then matted into a board. Insulation board may be cut into tiles and used in soundproof ceilings. Hardboard is made in much the same way as insulation board, but the fibers are dried before being compressed. Hardboard is harder than solid wood and is used in furniture and television and radio cabinets.

### Chemical Products

Wood cells consist of three chief substances, *cellulose*, *lignin*, and *hemicelluloses*. Cellulose is the main ingredient of the fibers that give wood its strength and structure. Lignin holds the fibers together. Hemicelluloses combine with cellulose and lignin to form the walls of wood cells. Manufacturers make thousands of products from cellulose. Lignin has far fewer uses, but it is used in such products as artificial vanilla, cosmetics, and soil conditioners. Hemicelluloses have little importance as a source of forest products.

Some of the most valuable products made from cellulose include paper, fibers, films, and plastics. Charcoal is also a widely used chemical product of wood. It does

### Some Uses of Forest Products

#### Wood Products

##### Hardboard

Cabinets	Paneling
Containers	Signs
Furniture	

##### Insulation Board

Ceiling tile	Sheathing
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##### Lumber

Baseball bats	Furniture
Boats	Mine timbers
Bowling pins	Musical
Boxes	instruments
Building materials	Pencils
Cabinets	Railroad ties
Caskets	Shingles
Crates	Toys
Flooring	Window frames

##### Round Timbers

Bridges  
Fence posts  
Foundations

##### Sawmill Wastes

Bedding for animals  
Floor-sweeping compounds  
Fuel  
Hardboard

##### Veneer

Barrels  
Baskets  
Boxes  
Cabinets  
Crates  
Furniture

Telephone poles  
Utility poles

Insulation board  
Packing material  
Particle board  
Pulp chips

Matches  
Paneling  
Tabletops  
Tongue depressors  
Toothpicks

##### Wood Pulp

Acetate	Photographic film
Cardboard	Plastics
Cellophane	Rayon
Explosives	Triacetate
Lacquer	
Paper	

#### Other Forest Products

##### Bark

Adhesives	Fuel
Cork	Soil mulch
Dyes	Tannic acid

##### Fruit

Beechnuts	Hickory nuts
Black walnuts	Pecans
Blueberries	Pine nuts
Cranberries	

##### Gum

Pine oil	Tall oil
Rosin	Turpentine

##### Leaves

Cedar-needle oil	Ornamental wreaths
Holly	Pine-needle oil

##### Sap

Maple sugar	Maple syrup
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#### Chemical Products

##### Charcoal

Explosives  
Filters

##### Fuel

##### Lignin

Animal feeds  
Artificial vanilla  
Drilling muds  
Pharmaceuticals

Plastics  
Road-building materials  
Soil conditioners

##### Particle Board

Cabinets	Furniture
Doors	Paneling

##### Plywood

Airplanes	Concrete forms
Boats	Containers
Boxes	Doors
Building materials	Furniture
Cabinets	Paneling

## FOREST PRODUCTS

not come from cellulose alone, but from the entire wood substance. Charcoal is made by heating wood until it is *charred* (scorched).

**Paper.** In the United States, about 98 per cent of the cellulose obtained from trees is made into paper. To make most kinds of paper, manufacturers cut the wood into chips and "cook" them in various chemical solutions to form a pulp. The pulp is washed and passed through a series of screens that remove unwanted substances, leaving cellulose fibers and water. After being drained, bleached, and washed again, the pulp is matted into a sheet. A machine squeezes the sheet between rollers and dries it to form paper or paperboard. Heavy paperboard for cartons and other industrial products accounts for about half the output of U.S. paper mills.

**Fibers and Films** made from wood are manufactured by treating sheets of cellulose with a variety of chemical solutions. These solutions turn the cellulose into a thick liquid. The liquid is forced through tiny holes or narrow slits and treated with chemicals to make specific fibers and films.

Cellulose fibers, such as acetate and rayon, are widely used in making clothing, draperies, and upholstery.

Cellulose films include cellophane and photographic film.

**Plastics** manufactured from wood are among the toughest produced. They are made by combining cellulose with chemicals to obtain such compounds as cellulose acetate, cellulose acetate butyrate, and ethyl cellulose. Manufacturers mold these compounds into simple shapes, such as sheets and tubes. The molded plastics are then sent to companies that use them in making various products, including combs, tool handles, and toys.

**Charcoal** is made by heating wood in an oven that contains little or no air. During this process, called *destructive distillation*, the wood gives off various gases and turns into charcoal. Charcoal is an important fuel in many developing countries, but in the United States it is used mainly in barbecue cooking. Charcoal may also be purified to form *activated charcoal*, which can be used to remove odors and impurities from air and many substances.

### Other Forest Products

Although most forest products are made from wood, many come from the bark, fruit, gum, leaves, and sap of trees.

Bark from the cork oak tree provides cork for such

### 10 LARGEST FOREST PRODUCTS COMPANIES IN THE UNITED STATES

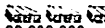
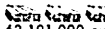
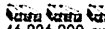

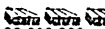





Company	Forest Products Sales	Total Sales*	Total Employees	Year Founded	Headquarters
1. International Paper Company.....	\$3,455,100,000	\$3,668,900,000	51,690	1898	New York, N.Y.
2. Georgia-Pacific Corporation.....	3,321,000,000	3,675,000,000	37,000	1927	Portland, Ore.
3. Weyerhaeuser Company.....	3,282,770,000	3,282,770,000	48,030	1900	Tacoma, Wash.
4. Champion International Corporation....	3,126,620,000	3,126,620,000	43,150	1937	Stamford, Conn.
5. Boise Cascade Corporation.....	2,314,174,000	2,315,780,000	37,310	1931	Boise, Ida.
6. St. Regis Paper Company.....	1,970,140,000	1,996,340,000	31,000	1899	New York, N.Y.
7. Kimberly-Clark Corporation.....	1,712,900,000	1,725,450,000	28,550	1872	Neenah, Wis.
8. Crown Zellerbach Corporation.....	1,688,916,000	2,318,320,000	31,720	1870	San Francisco, Calif.
9. Scott Paper Company.....	1,404,600,000	1,520,230,000	21,300	1879	Philadelphia, Pa.
10. Mead Corporation.....	1,120,800,000	1,821,830,000	27,800	1846	Dayton, O.

\*Includes all sales and services.

Source: Standard & Poor's Compustat Services, Inc., 1977 figures.

### States and Provinces Leading in Forest Products







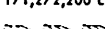
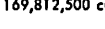
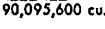
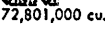
Wood cut each year

British Columbia	 90,939,200 cu. yds. (69,528,000 m <sup>3</sup> )
Oregon	 62,191,000 cu. yds. (47,548,400 m <sup>3</sup> )
Washington	 46,906,000 cu. yds. (35,862,200 m <sup>3</sup> )
Quebec	 38,011,700 cu. yds. (29,062,000 m <sup>3</sup> )
California	 32,288,000 cu. yds. (24,685,900 m <sup>3</sup> )
Alabama	 29,696,000 cu. yds. (22,704,200 m <sup>3</sup> )
Georgia	 27,119,000 cu. yds. (20,734,000 m <sup>3</sup> )
Louisiana	 23,793,000 cu. yds. (18,191,100 m <sup>3</sup> )
Ontario	 23,384,800 cu. yds. (17,879,000 m <sup>3</sup> )
Mississippi	 22,626,000 cu. yds. (17,298,800 m <sup>3</sup> )

Sources: U.S. Department of Agriculture; Statistics Canada. Latest available figures—1976 for provinces, 1972 for states.

### Countries Leading in Forest Products

Wood cut each year

Russia	 502,951,500 cu. yds. (384,534,000 m <sup>3</sup> )
United States	 446,530,400 cu. yds. (341,397,000 m <sup>3</sup> )
China	 255,221,700 cu. yds. (195,131,000 m <sup>3</sup> )
Brazil	 214,497,400 cu. yds. (163,995,000 m <sup>3</sup> )
Canada	 173,163,500 cu. yds. (132,393,000 m <sup>3</sup> )
India	 171,272,200 cu. yds. (130,947,000 m <sup>3</sup> )
Indonesia	 169,812,500 cu. yds. (129,831,000 m <sup>3</sup> )
Nigeria	 90,095,600 cu. yds. (68,883,000 m <sup>3</sup> )
Sweden	 72,801,000 cu. yds. (55,660,000 m <sup>3</sup> )
Japan	 49,877,400 cu. yds. (38,134,000 m <sup>3</sup> )

Source: FAO. 1976 figures.